PROGRAM REVIEW
1982-83

NEWFOUNDLAND FOREST RESEARCH CENTRE

Environment Canada
Canadian Forestry Service

Environnement Canada
Service canadien des forêts

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PROGRAM REVIEW

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CANADIAN FORESTRY SERVICE

DEPARTMENT OF THE ENVIRONMENT

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THE CANADIAN FORESTRY SERVICE
DEPARTMENT OF THE ENVIRONMENT

The Canadian Forestry Service (CFS) is the principal source of federal expertise in forestry. Its general objective is to promote the wise management and use of Canada's forest resource for the economic, social and environmental benefit of Canadians.

The following are the main functions of the CFS:

1. providing coordinated federal policies to promote forest industry development and better resource management;
2. providing scientific and technical leadership through research and development;
3. providing and analyzing national and international information and statistics as a basis for policy;
4. aiding in developing and certifying codes and standards of product performance;
5. protecting Canada's forests from foreign pests;
6. supporting provincial forest renewal programs to insure permanent viability of the forest resource;
7. fostering the potential use of the forest resource for energy; and,
8. contributing to the environmental objectives of the Department of the Environment.

A number of federal agencies are involved in forestry programs, and a Federal Forestry Sector Strategy Committee has been established to coordinate federal forestry activities. The CFS has been designated the lead agency.

In September, 1982, the Canadian Forestry Service assumed responsibility for regional economic development from a forestry standpoint. In this context the Service is required to negotiate federal-provincial forest renewal agreements of intensive forest management practices to meet the objective of the federal forest sector strategy. As a result, the CFS is also involved in the development of economic profiles and studies to identify regional and national needs, and development opportunities.

The Canadian Forest Service is composed of a headquarters unit, six forest research centres, and two national institutes. The forest research centres are responsive to regional priorities and maintain close liaison with the respective provincial government forestry departments. They also participate in, and frequently lead, national programs. The national institutes provide the focus for programs of national scope. The headquarters unit comprises three directorates —Research and Technical Services, which plans, directs and coordinates the research and development programs and technical services of the CFS; Forestry Relations, Economics, and Development, which handles forestry relations with university, industry and other governments, economic analyses, as well as the coordination of the forestry development and employment stimulation programs; and Finance, Planning, and Administration, which manages the support services of the CFS in planning and program evaluation, finance, administration, and human resources management.

LE SERVICE CANADIEN DES FORETS
MINISTERE DE L'ENVIRONNEMENT

Le Service canadien des forêts (SCF) réunit la majorité des spécialistes fédéraux en foresterie. Son objectif général est de promouvoir l'aménagement et l'utilisation judicieux des ressources forestières du Canada pour le plus grand bien économique, social et environnemental des Canadiens.

Voici les principales fonctions du SCF:

1. fournir des politiques fédérales coordonnées afin de favoriser l'expansion de l'industrie forestière et l'amélioration de la gestion des ressources;
2. fournir une orientation scientifique et technique par la recherche et le développement;
3. fournir et analyser l'information et les statistiques nationales et internationales qui serviront de base aux politiques;
4. aider à la mise au point et à la certification des codes et des normes en matière de performance des produits;
5. protéger les forêts canadiennes en luttant contre les ravageurs étrangers;
6. appoyer les programmes provinciaux de régénération forestière afin d'assurer la viabilité permanente des ressources forestières;
7. parrainer l'utilisation éventuelle des ressources forestière afin d'assurer la viabilité permanente des ressources forestières pour la production d'énergie; et
8. adhérer aux objectifs environnementaux du ministère de l'Environnement.

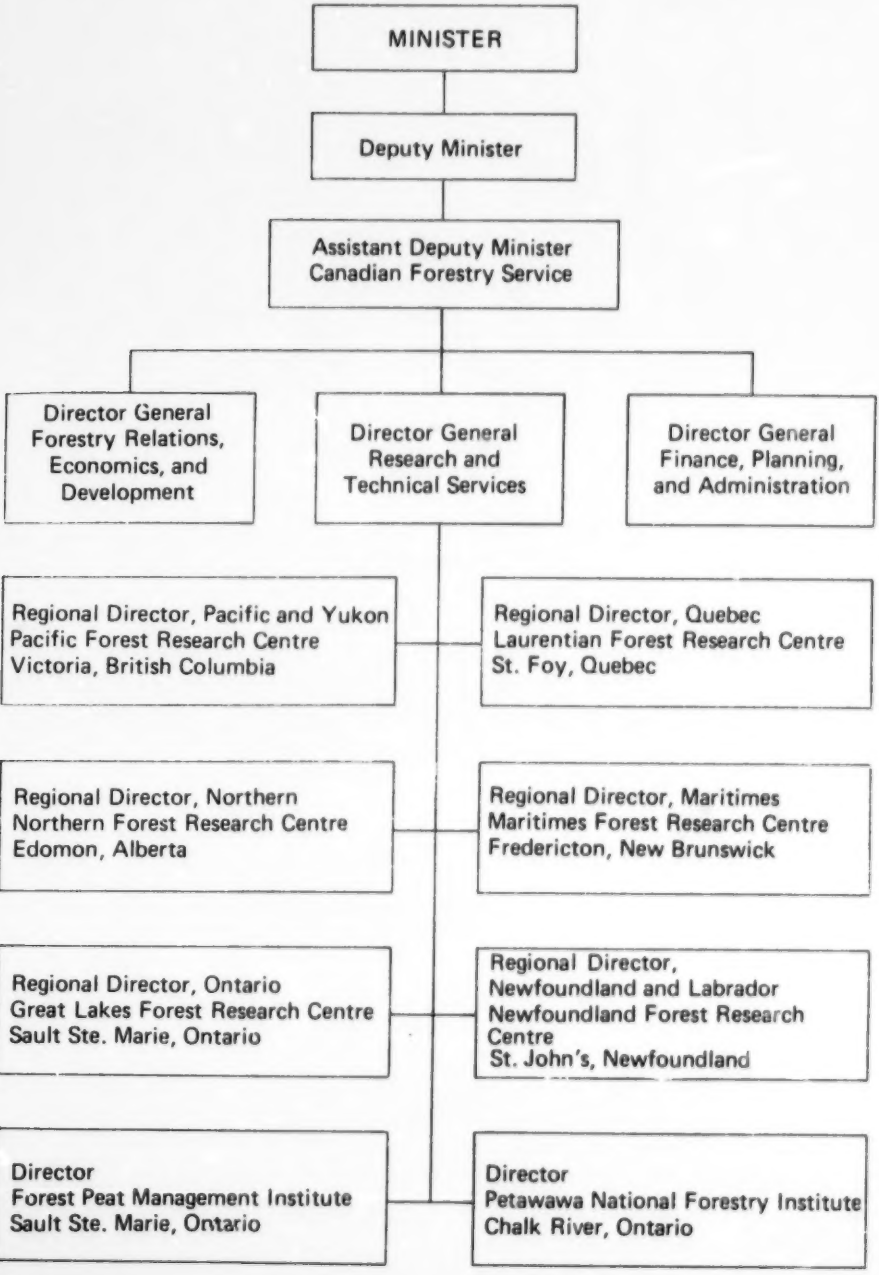
Depuis septembre 1982, le SCF assume la responsabilité du développement économique régional dans le domaine forestier. A ce titre, il doit conclure des ententes fédérales-provinciales, relatives à la régénération forestière, sur des méthodes de gestion intensive des forêts afin d'atteindre les objectifs de la stratégie forestière du Canada. Le SCF doit conséquemment participer à la mise au point de profils et d'études économiques afin de cerner les besoins sur les plan régional et national, de même qu'aux possibilités de développement.

Le SCF comprend une administration centrale, six centres de recherche forestière et deux instituts nationaux. Les centres de recherche forestière doivent répondre aux impératifs régionaux et entretenir une liaison étroite avec les ministères provinciaux des Forêts. Ils participent également à des programmes nationaux dont ils assument fréquemment la direction. Les instituts nationaux sont les foyes des programmes d'envergure nationale.

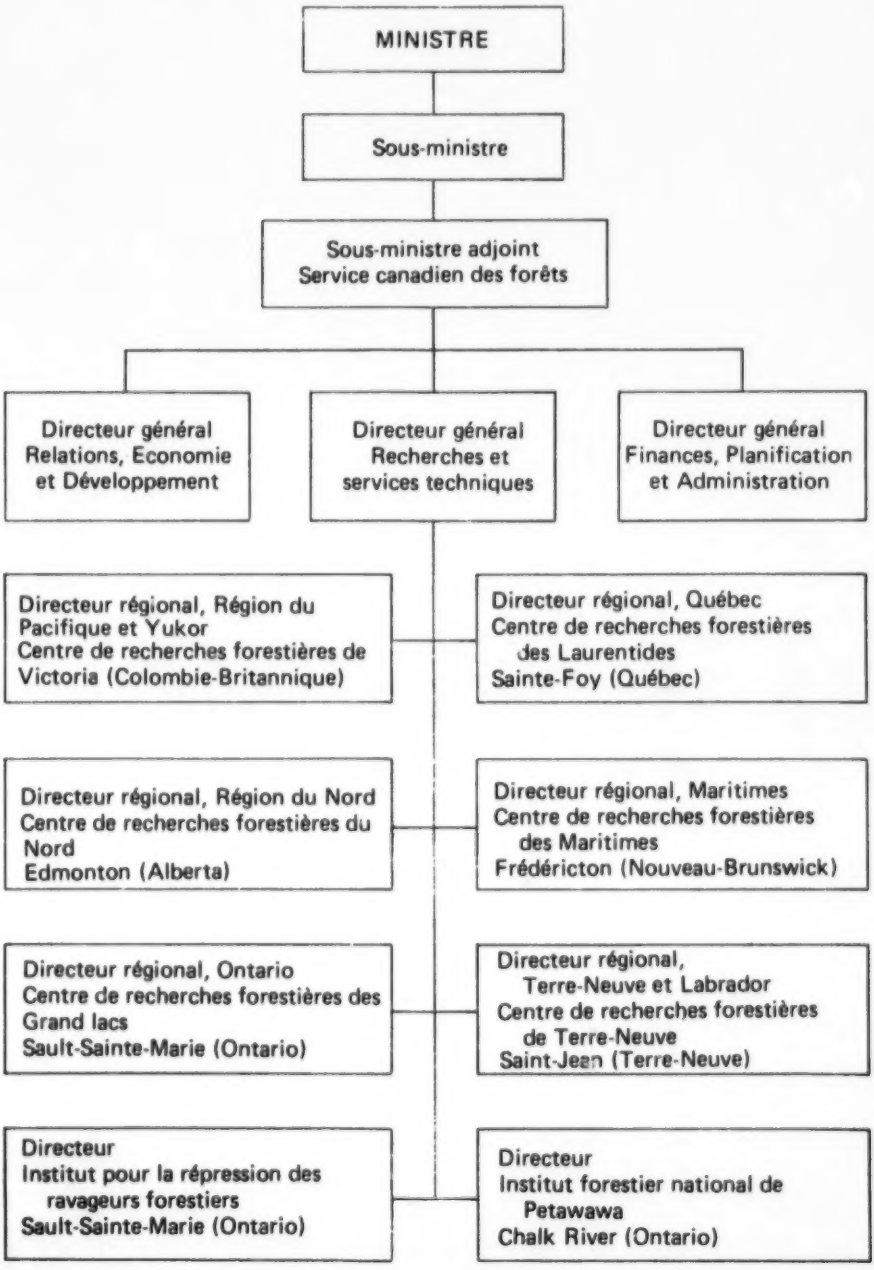
L'Administration centrale comprend trois directions générales: Recherche et Services techniques, don le rôle consiste à planifier, diriger et coordonner

les programmes de recherche et développement ainsi que les services techniques du SCF; Relations, Economie et Développemnt, qui s'occupe des relations forestières avec les universités, l'industrie et les autres gouvernements, d'analyses économiques ainsi que de la coordination des programmes de développement forestier et de création d'emplois; et Finances, Planification et Administration, qui dirige les services de soutien du SCF dans la planification, l'évaluation des programmes, les finances, l'administration et la gestion du personnel.

DEPARTMENT OF THE ENVIRONMENT



MINISTERE DE L'ENVIRONNEMENT



FOREWORD

This program review of the Newfoundland Forest Research Centre covers the period from April 1982 to March 1983. The various research projects and studies conducted during the year are listed, the achievements are described and lists of publications and related productivity are provided.

The Research Centre conducts a research program which is responsible to the forest management needs of the people of Newfoundland, the provincial government and the forest industry. Its objective is to provide the scientific, technological and economic information services required for the improvement, protection, and efficient utilization of the forest resource of the province. Its principal clients are the Provincial Department of Forest Resources and Lands, the Newfoundland forest industries, federal agencies having forestry and related programs, and the public who frequently seek advice on forestry problems. While the program is primarily regional in orientation, it also reflects national priorities and concerns. During the year four research projects were given formal evaluation by special evaluating committees selected from several agencies which have forestry and related interests, e.g. university, provincial forest and environmental agencies and other federal agencies.

Two major seminars on forest protection research activities were presented to a variety of interest groups in Grand Falls and Corner Brook in May. The Research Centre also participated in a departmental public consultation meeting in St. John's in October which addressed such topics as the spruce budworm in Newfoundland and research in biological control of forest insect pests.

One of the highlights of the year was the organization of the Forestry Development Branch by acquisition of 10 additional person years and combining these with the former forest economics group. In March 1983 the staffing complement of NeFRC was 74 person years comprised of 26 professional, 30 technical, and 18 administrative support staff. There were 26 students on staff during the summer, employed in a career internship program sponsored by the Canada Employment and Immigration Commission. For the period January to April, the Centre conducted forestry projects under the Unemployment Insurance Job Creation (UIJC) and New Employment Expansion and Development (NEED) programs which provided 22 jobs. The Centre also participated in administering three projects under the Summer Canada Youth Employment program which gave employment to 27 students. Two research officers were given educational leave to attend university, and eight employees were assisted in taking special courses at Memorial University of Newfoundland as part of the Centre's continuing upgrading program. Staffing of seven vacant positions were achieved of which two were professional, two technical, and three administrative support. Construction was completed on a green-house complex especially equipped for acid rain studies and a building adjacent to the one now occupied by NeFRC was extensively renovated to provide additional office and laboratory space for the research and development program.

The principal work of the Centre is included under the following headings:

MANAGEMENT, ADMINISTRATION AND TECHNICAL SERVICES

Forestry research is an essential element for effective management of the forest resource. The annual budget of NeFRC is in excess of $3.5 million which includes funding for salaries, operations and maintenance, capital expenditures in Research and technical Services and in Forestry Regional Development. Effective program direction and management is important to ensure the best use of the financial and personnel resources available. A variety of items are included within the program including research direction and management, financial and purchasing services, research support, technical services and technology transfer activities.

FOREST RESOURCES AND ENVIRONMENTAL RESEARCH

Forest resources research involves the acquisition of biological data on forest and wildland ecosystems and the development concepts in intensive forest management to ensure a continuing supply of industrial wood and to preserve aesthetic and associated forest values. Activities are varied and include studies of soils, forest, wetland and heathland ecology, reforestation, tree growth, forest genetics, environmental forestry, and effects of atmospheric pollutants on vegetation.

FOREST PROTECTION RESEARCH

Research and services programs in forest protection include surveys for the detection of forest insects and diseases, the monitoring and forecasting of their geographic distribution and intensity, and an assessment of damage. Research is conducted on the biology of important pest species, on natural control factors and on the development of pest management strategies and guidelines to minimize forest losses to insects and diseases. A major effort is devoted to special surveys to determine the magnitude of spruce budworm outbreaks and the extent of forest losses.

FORESTRY DEVELOPMENT

The Forestry Development Branch has responsibilities associated with the administration of federal-provincial forestry agreements and various job creation programs implemented in co-operation with the Canada Employment and Immigration Commission. The Forestry Development Branch is under the direction of a program manager. There are two divisions in the Branch – one responsible for economic analysis and evaluation of agreements and the other for the development, planning and implementation of agreement activities.

–W.J. CARROLL
Regional Director

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MANAGEMENT, ADMINISTRATION & TECHNICAL SERVICES

Regional Director: W.J. Carroll

PROJECT 1101

Service Management and Support

Project Leader: W.J. Carroll

Objectives: To ensure efficient planning and management of the research and development activities of NeFRC; to ensure effective use of financial and staffing resources to achieve stated goals and objectives; to ensure that NeFRC activities are responsive to regional needs and priorities and concerns of the Government of Canada.

Achievements Current Year: Direction was provided for the NeFRC program of about 70 studies organized under 12 projects. Four project evaluations were conducted and formal reports prepared. An annual review of the principal elements of the R & D program was prepared. Two research officers were granted educational leave of absence to upgrade their qualifications. A Regional Development Section was organized to undertake responsibilities associated with administration of federal-provincial forestry agreements and to expedite the job creation program in forestry in cooperation with CEIC. Renovations in an adjacent building provided additional laboratory and office space and a new modern greenhouse was completed at the Canada Agriculture Research Station. Total cost of construction amounted to $1 million.

Projections: Continue to provide direction and management of the NeFRC research and development program and complete staffing of the Regional Development Section. Manage personnel resources of about 74 person years and 30 student positions. Complete the transfer of staff and equipment to the newly renovated building. Hold two meetings of the Canada-Newfoundland Joint Forest Research Committee.

PROJECT 1401

Financial Services

Project Leader: R.F. Best

Objectives: To provide financial, consulting and accounting advisory services to NeFRC management; to ensure adequate internal control of finances, provide a complete range of accounting services and maintain adequate accounting records.

Achievements Current Year: Financial accounting and advisory services were provided. Two new staff members were added, one to provide accounting services and the other a Purchasing-inventory Support for the newly organized Forest Economics and Regional Development section which became responsible for federal-provincial forestry agreements. The new section will also be responsible for financial administration of job-creation projects with CEIC. Accounting responsibilities were increased to include payment of contributions to the Province under the Agreement and control of operations and maintenance funding assigned to these various undertakings. Problems encountered with previous accounting methods in federal-provincial agreements were reported to CFS

headquarters and to appropriate federal and provincial agencies. Financial status reports were produced as scheduled and the AFMAS system was utilized satisfactorily.

Projections: Continue to provide accounting and advisory service to management of NeFRC. Ensure that an effective accounting service is provided to all segments of the NeFRC program. Make more effective use of the AFMAS system to provide an accounting service at the project and study levels. In line with audit comments in the current year, attempt to utilize AFMAS to give greater financial management responsibility at the Program Manager level. Prepare required accounting and financial status reports as required.

PROJECT 1501
Administrative Services
Project Leader: R.F. Best

Objectives: To ensure effective administrative services for personnel and office services, material management and purchasing, records and field, and other facilities.

Achievements Current Year: Repairs and upgrading of field stations were continued. Inspection reports indicate that required standards were maintained. A new greenhouse facility was completed at the Agriculture Canada Research Station which gives NeFRC a range of growth compartments with individual environmental controls and a large chamber for acid rain research. Renovations were completed to a second building to provide space for larger chemistry and forest pathology and ecology laboratories, office space for related programs and for the Forest Insect and Disease Survey staff. Vehicle replacement was continued where required. Personnel services were provided to the Research Centre staff.

Projections: Continuation of regular preventive maintenance at field stations and construction of a helicopter landing pad at the central Newfoundland station. Landscaping will be upgraded at both stations. Existing word processors may be replaced by a new type depending on availability of funds. Programs in personnel, purchasing, records maintenance will continue and where feasible improvements will be introduced to improve efficiency.

PROJECT 2104
Research Support Services
Project Leaders: F.C. Pollett and J. Hudak

Objectives: To provide an efficient and high quality support service to meet the needs of the NeFRC research and development program.

Achievements Current Year: *Library Service* – The service continued and acquisition included 170 reference books, 1300 serials and about 600 inter-library loans. Additional library space was provided to house the increasing number of acquisitions. *Mycological Herbarium* – Collections of mycological specimens were continued and incorporated into the herbarium collection. A Sirococus shoot blight was recorded on blank spruce seedlings for the first time in 1982. *Insect Reference Collection* – The biological survey in northern Newfoundland resulted in addition of new insect specimens to NeFRC collection. The survey

was conducted as a SYEP project involving CEIC funding. About 100 new species were added to the NeFRC reference collection in 1982. *Plant Herbarium* – The herbarium was moved to a more satisfactory and better equipped room. The material was inventoried and badly damaged specimens were removed and others repaired. In its new location, the herbarium is more accessible to research staff. *Seed and Planting Stock Service* – Seedling production continued at the nursery and the special ENFOR project on production of willows was maintained. *Chemical and Physical Analyses Laboratory* – Automated methods for determination of total sulphur and total chloride in plant samples were developed. A method for determination of total alkalinity of water was implemented and a new total dissolution procedure for metal analysis in plants was evaluated. *Computer Services* – The new PDP 11/44 computer systems is now fully operable and a user course for operators has been developed for staff training purposes.

Projections: (1) *Library Services* – The library service will continue as before and classification of the library collection from Oxford to Library of Congress sytem will be completed. (2) *Mycological Herbarium* – To maintain the herbarium, continue collection and identification of tree disease samples; to expand and improve the reference collection; conduct observations on disease pests that are new to the province. (3) *Insect Reference Collection* – Continue biological survey with assistance of SYEP program, attempt to obtain collections from Northern Labrador and publish a comprehensive listing of insect specimens in the collection. (4) *Plant Herbarium* – To produce a computerized accessions list; produce guidelines for field staff to aid in collection and preservation of specimens; to establish a specialized reference collection for assistance of staff in identification of species; and to expand the herbarium. (5) *Seed and Planting Stock Supply Service* – Continue the work, transplant willow cuttings, and undertake other duties as required. (6) *Chemical and Physical Analyses Laboratory* – To continue the service and evaluate IWD's (Moncton) LABS II laboratoy data management program for use in water sample analysis. (7) *Computer Services* –To design and implement systems as required, e.g., vegetation synthesis system, budworm damage system, IWD laboratory data management system; to examine graphics and statistics packages for possible use and to complete the User Course for PDP 11/44 and present it to staff.

List of Studies:

1. Seed and planting stock supply service
2. Chemical and physical analysses laboratory
3. Plant herbarium
4. Computer services
5. Mycological herbarium
6. Insect reference collection
7. Library Services

PROJECT 2604
Technology Transfer

Project Leader: D.R. Rex

Objectives: To develop a program of technological transfer and liaison to promote an understanding of the activities and research results of the Canadian Forestry Service among clients; to conduct a public information program to advise the public of forestry concerns and interests of CFS; to be responsible for maintenance of technical editorial standards in reports and for promotion of CFS reports.

Achievements Current Year: During 1982, five issues of the newsmagazine "Woody Points" were prepared and distributed. The magazine format was revised and the mailing list was updated and computerized. Technology liaison meetings with forestry field staff of the Province and industry were important items throughout the year. Two major technology transfer seminars in forest protection were organized and coordinated at Grand Falls and Corner Brook. Coordinating assistance was also given to the various program reviews held and the opening of the NeFRC greenhouse. A number of press conferences and press releases were organized. Technological support was given to such agencies as NFPA, CIF, the Managment Committees for forestry agreements, etc. A program review booklet was produced and distributed. NeFRC forestry displays were set up at Corner Brook for National Forestry Week and at St. John's for National Environment Week, and later at Grand Falls and in a number of schools in eastern Newfoundland. Technical editing activities were provided in conjunction with preparation of Information Reports and mailing lists were revised and computerized. Responses were made to over 1000 requests for forestry information.

Projections: Technology transfer and forestry liaison activities with field forestry staff of client agencies will be emphasized. Five editions of the newsletter "Woody Points" will be published, a program review booklet will be prepared and distributed, and technical editing assistance will be continued. A series of newspaper columns on how to deal with forestry related problems and concerns will be prepared. There will be 18 to 20 press releases on activities under forestry agreements, job creation activities and research activities. In cooperation with provincial forestry staff, the Newfoundland Forestry Note series will be revised and reissued. Additional forestry display material, including a mobile trailer display, will be developed and eight to ten forestry displays will be presented in schools and for special community events. Organizational logistical support will be provided for a special seminar series on silviculture and forest renewal to be held during National Forestry Week, and to a special silviculture seminar scheduled for Grand Falls in April. Support will be given to activities of NFPA, CIF and other agencies as required.

FOREST RESOURCES AND ENVIRONMENTAL RESEARCH

A/Program Manager – A.B. Case

PROJECT 2201

Environmental Factors and Forestry Practices

Project Leader: A.B. Case

Objectives: To assess and evaluate the physical impact of forest management practices on forest and wildland ecosystems; to test ameliorative measures and provide guidelines and prescriptions for minimizing disturbances and for maintaining or improving productivity in areas disturbed by forest practices; to provide advisory services to resource and environmental agencies.

Achievements Current Year: NeFRC provided advisory services to Nfld. DOE through continued participation on the Assessment Advisory Committees dealing with hydroelectric developments, and through participation on newly established committees dealing with two major timber harvesting developments in western Newfoundland. Advisory services to the DOE Regional Office were provided through membership on the Energy/Environment Strategy Committee. Representation on the Biomass Development Committee and advisory services to outside agencies continued in 1982. The EARP ad hoc Environmental Screening Committee scrred all 1982 resource road and silviculture proposals submitted under the GDA for Forestry. The Newfoundland SCC was reactivated. Guidelines for screening of CFS work activities were developed. Two papers were prepared and presented at an International Seminar to Moscow – one on biomass losses on forestry operations in Canada; the other on technologies and machine systems for reducing biomass losses on clearcutting operations in eastern Canada. The latter is to be published in the Soviet Forest Industries Journal and by the Canadian Pulp and Paper Association.

Projection: The NeFRC will be represented on the Assessment Advisory Committee to review impact statements on the Upper Humber and Little Grand Lake timber harvesting proposals. Development of timber harvesting guidelines will be initiated and an information report, "The Fuelwood Potential of Logging Residues in Central Newfoundland", will be published.

List of Studies:

1. Environmental assessment of logging practices
2. Environmental assessment of forest resource roads and highways
3. Operational terrain classification
4. Services to EARP/RSCC

PROJECT 2202

Environmental Impact of Atmospheric Pollutants

Project Leader: S.S. Sidhu

Objectives: To assess the effects of industrial pollutants on vegetation and soils; to develop ameliorative measures and guidelines to minimize the effects of air pollution; to evaluate the adequacy of existing air quality standards for the protection of terrestrial ecosystems in Newfoundland; to advise provincial government and industry on experimental design and sampling techniques for

monitoring effects of pesticides on vegetation and soils; to develop strategies for assessing short – and long-term effects of pesticide sprays on vegetation and soil; and to determine the long-term effects of simulated acid rain on forests and soils in Newfoundland.

Achievements Current Year: Advisory services were provided to Newfoundland Hydro on the impact of SO_2 emissions near their oil-fired generator. Vegetation plots were re-examined for SO_2 damage. A paper was prepared on fluoride deposition through leaf litter and precipitation. Updated results of the fluoride study were presented at meetings with EPS, Nfld. DOE, ERCO and Boyce Thompson Institute. A special report on 'Considerations for Regulatory Fluoride Standards based on Fluoride Accumulations in Vegetation' was prepared as a guideline for Nfld. DOE in establishing new fluoride regulatory standards for the province. Data from the chemical analysis of asbestos dust and vegetation at Baie Verte were summarized in a research publication. A public awareness brochure 'Acid Rain – A Newfoundland and Labrador Perspective' was prepared in collaboration with DFO, Nfld. DOE, Mines and Energy, and other services of Environment Canada.

Projection: To continue to monitor F-damage on vegetation and soils near the phosphorus plant. Complete a publication on relationships between F-accumulation in foliage, F-flux measured by fluoridation plates and visible F-damage under long-term exposure of vegetation to fluoride emission. To initiate a study on the effects of fluoride on pollen germination, seed and fruit development, and seedling growth. To provide advisory services to governmental agencies and Newfoundland Hydro on impact of air pollutants on forest vegetation and soils. To supervise and contribute to a study by a visiting scientist on the effects of fluoride emission in fruiting and seeding success in berry producing species. Upon compeltion and calibration of the acid rain facility, experiments to determine the effects of simulated acid rain on soil nutrient depletion and plant growth will be initiated. Complete analysis of buffering capacity data and prepare a publication. Experiments on relative sensitivities of foliage of several Newfoundland plant species will be initiated. To complete experiments on pollen germination and prepare a pubiication.

List of Studies:
1. Effects of acid rain on vegetation and soils in Newfoundland.
2. Effects of fluoride emissions on vegetation and soils.
3. Advisory services to environmental agencies.

PROJECT 2204
Forest and Plant Ecology
Project Leader: W.J. Meades

Objectives: To determine the ecological relationships between major vegetation types of Newfoundland and Labrador and their natural environment; to develop an increased understanding of the reaction of major vegetation types to man's activities; i.e., drainage, logging and fire; to increase knowledge of autecology of species having particular importance in Newfoundland and Labrador; to apply the data bank generated from such studies to forest and other land management problems; to provide national and international leadership and technology transfer in ecological land classification and peatland development.

Achievements Current Year: The peatland classification survey was extended

into northern, central, and southern Labrador. Detailed vegetation descriptions and soil samples were taken for laboratory analysis. More detailed investigations were undertaken on a large peatland complex in central Labrador. A large-scale computer map generated from Landsat imagery by the Ontario Centre for Remote Sensing was ground truthed. Finnish and Swedish peatland technologies were observed during a two-week study tour in Scandinavia. A seminar on Newfoundland peatlands was presented to the Institute of Terrestrial Ecology (University of Uppsala) upon invitation by the department head. Field studies were undertaken on the classification of forest and heath in Labrador. Ecoregion boundaries for the Ecoregions of Canada (CCELC, Ecoregions Working Group) were finalized in consultation with Lands Directorate scientists in Halifax and Quebec. A habitat map and habitat descriptions were completed for the range of the Grey River caribou herd. Field work for autecological studies on red pine and white spruce are continuing and the larch study is at publication stage. Chapters on the soils, peatland and heathlands of Newfoundland were finalized and have been published in "The Biogeography and Ecology of the Island of Newfoundland". Two papers were presented at the Peatland Inventory Methodology Workshop and another at the Institute of Gas Technology Symposium. A paper on the successional status of dwarf shrub heath was presented and published in the Proceedings of the Twenty-fourth Session of COSPAR. Two papers, one on red pine and the other on palsa bogs, were presented at the Canadian Botanical Association meetings. A paper on serpentine soils was presented at the annual meeting of the Canadian Society of Soil Science. Also, several seminars and miscellaneous papers were presented at Memorial University and to government agencies.

Projection: To initiate a new study on thematic mapping for forest management. To obtain additional phytosociological descriptions of forest, heath and peatland ecosystems in Labrador. To complete habitat mapping and habitat descriptions on the Grey River caribou herd. To complete thesis on succesional relationships of forest and heath vegetation. To complete PhD thesis on red pine. To publish information report on the autecology of larch. To complete studies on the allelopathic interaction of Kalmia and black spruce. To undertake detailed analysis of a peatland complex in central Labrador. To continue studies on the autecology of white spruce.

List of Studies:

1. Multiple use potentials of wetlands
2. Ecological investigations of heathlands
3. Forest classification and ecology
4. Autecological study of larch.
5. Autecological study of red pine
6. Ecology of Newfoundland soils
7. Autecological study of white spruce
8. Wetlands (CCELC) national and international activities
9. Ecological investigation of the afforestation potential of peatlands
10. Ecoregions of Canada
11. Thematic mapping for forest management in Newfoundland

PROJECT 2501
Energy from Forest Biomass

Project Leader: R.S. van Nostrand

Objectives: To determine the feasibility of harvesting and using forest biomass for energy production in Newfoundland; to develop long-term strategies for the

utilization of biomass for energy; to develop methods and techniques for biomass inventory and management; to assess environmental impacts of biomass harvesting and methods of reforestation.

Achievements Current Year: Oven-dry mass equations, by components, for the commerical tree species of the Island of Newfoundland were completed and the results published. The second phase of the Bowater Newfoundland biomass harvesting trial tested a Swedish whole-tree chipper and a variety of other harvesting and porcessing equipment to determine the economic feasibility of integrated full-tree harvesting to produce pulpwood and hog fuel from mixed wood stands. Results from the trial were not encouraging. A report on the results of Phase I of the trial was completed and published (P-191). Two pilot biomass inventory trials were completed: the first involved complete above-ground biomass sampling carried out in conjunction with a conventional volume inventory survey for the Avalon Peninsula (P-240); the second was a pilot trial to convert conventional volume inventory data to biomass data for all of Newfoundland. The latter trial was conducted with assistance from the Forest Statistics and Systems Branch (FSSB) as part of its biomass statistics pilot trial for all of Canada (P-242). Both trials involved extensive field sampling and substantial modification of the computer software used to produce inventory statistics for the Newfoundland Department of Forest Resources and Lands. Clonal testing and propagation for the *Salix* energy plantation study were expanded; a pilot study to estimate the potential of *Salix* energy plantations on the Avalon Peninsula was initiated (P-172). Two related contractors' reports were completed. ENFOR project proposals for 1983-84 were prepared.

Projection: To publish results of the Bowater harvesting trial (P-191). To expand the *Salix* energy plantation work by mass propagation of selected 'energy' clones, conducting regional geographic and market potential studies, biophysical studies for clonal trials, qualitative and quantitative biomass productivity studies, and systems engineering studies (P-172). To measure growth and mortality among trees planted and seeded on the whole-tree harvested area, analyze data and prepare a report (P-145). To collect data on disturbance and regeneration development from semi-permanent sample plots established on areas harvested for biomass (P-241). To conduct a survey of domestic fuelwood consumption on the Island of Newfoundland. To identify and assemble data necessary to calibrate the FORCYTE growth model. To develop ENFOR project proposals for 1984-85.

List of Studies:

1. Development of biomass equations for major tree and shrub species
2. Reforestation after whole tree chipping for hog fuel
3. Boreal Energy Plantation R & D (formerly 'Salex (willow) for biomass fuel and energy conservation'
4. Harvesting forest biomass as an alternate fuel
5. Forest biomass inventory pilot trial
6. Domestic fuelwood consumption in Newfoundland
7. Testing the FORCYTE growth model for Newfoundland forest types

PROJECT 2301
Tree Seed and Improvement Research

Project Leader: J.P. Hall

Objectives: To evaluate the productive potential, through species and prove-

nance testing, breeding and selection, of various native and exotic tree species suitable for reforestation in Newfoundland; to provide technical assistance and services to provincial government and industry in Newfoundland and to outside agencies to ensure that research findings are translated into economic and environmental gains.

Achievements Current Year: *Black Spruce* – Two journal publications in isozyme studies are in press. A journal publication on the all-range provenance study has been completed; it provides estimates of genotypic stability and provenance quality indices of 57 provenances from range-wide distributions. Another journal publication has been prepared on the genetics of cone morphology and provides estimates of means, standard deviation and heritability of these characters and their variation patterns. In 1982 controlled pollinatins were completed on 12 mother trees comparing varying degrees of inbreeding from 0 to 100%. Seed data are now being analyzed. Analyses of growth rate and wood density data have indicated that the two parameters are not related and that selection of fast-growing individuals would not result in a lowering of wood quality. A study designed to develop methods for delaying flower receptivity was begun. A study to evaluate exogenous growth substances for induction of flowering on black spruce was also begun. *White Spruce* – A series of controlled pollinations was done on several superior provenances to compare the effects of crossing between and within provenances. *Larch* – Seedlings from inter and intra-specific crosses were planted in the field for evaluation. Studies on pollen development were continued. Controlled pollinations were done on *L. kaempferi, L. decidua* and *L. laricina*. Seed was collected for inclusiion in an all-range provenance trial of *L. laricina*. *Sitka Spruce* – Second measurements at the age of 18 years have been completed and the data are being analyzed. *Hybrid and Exotic Poplars* – A journal paper has been prepared on the potential of poplars for the boreal region. In addition to identifying superior clones, it provides estimates of genetic stability and clone quality indices for 20 clones. *Exotic Species* – An evaluation was made of all plantings of exotic species in Newfoundland and the results published. Seed of exotic *Larix* and *Alnus* species were sown in the nursery. *Advisory Services* to provincial and industry agencies were continued in 1982-83.

Projection: *Black Spruce* – To publish the results obtained from all the data collected and analyzed from provenance and progency studies; to analyze seed data from 1982 crosses and grow seedlings in greenhouse; to continue analysis of the wood-density growth rate data; to analyze data from flowering experiments. *White Spruce* – To publish results obtained from all the data collected and analyzed; to analyze seed data from 1982 crosses and grow seedlings in greenhouse; to outplant seedlings from the 1980 crosses. *Larch* To analyze seed data from the 1982 crosses and grow seedlings in the greenhouse; to continue pollen development studies and begin analysis of data. *Sitka Spruce* – To publish the results obtained from all the data collected and analyzed. *Red Spruce* – To publish the results obtained from all the data collected and analyzed. *Exotic Species* – To continue measurement of existing plantations and acquire additional seed.

List of Studies:

1. Genetic improvement of black spruce in Newfoundland
2. Genetic improvement of white spruce in Newfoundland
3. Genetic improvement of larch in Newfoundland
4. Growth patterns of balsam fir from different origins
5. Provenance experiments of exotic fir and spruce species
6. Trials of hybrid and exotic poplars
7. Trials of exotic softwood species
8. Advisory services to the Tree Improvement Working Group

PROJECT 2302
Reforestation

Project Leader – J. Richardson

Objectives: To develop and demonstrate silvicultural techniques required to overcome site problems adversely affecting forest productivity on each of the major forest, peatland, and heathland types; to determine techniques for maximizing forest productivity through intensive management involving reforestation and silvicultural treatments.

Achievements Current Year: Detailed studies of distribution and stocking of softwood regeneration after logging on black spruce and balsam fir cutovers in central and western Newfoundland have continued. A study of the potential of large-scale aerial photography for regeneration surveys has been initiated. A report was published on the result of a recent remeasurement of the experiment comparing techniques for release of softwood regeneration from alder competition. The experiment comparing techniques for releasing softwood regeneration from unmerchantable hardwoods has been remeasured. A proposal was developed and carried out to monitor the effectiveness of an operational aerial herbicide application designed to release softwood regneration from hardwood competition. The cooperative series of planting stock comparision trials has been expanded to eight trials on recently cutover and burned cutover sites. A second cooperative series of trials has been initiated to compare the performance of various grades and sizes of black spruce bareroot planting stock when planted out of a variety of site conditions. Survival and growth of seedlings has been monitored in all plantation trials. Data on survival and growth collected in a recent remeasurement of peatland plantations in central Newfoundland have been analyzed. NeFRC co-chaired the organizing committee for a major silviculture symposium held in 1983 under the sponsorship of the Management Committee for the Forestry Subsidiary Agreement. Also, under the Management Committee, NeFRC is co-charing an inter-agency working group on stand reclamation. Several tours of the regeneration research demonstration area at North Pond have been conducted for professional and student groups. Assistance was given to an industry training course in silviculture. Papers on regeneration research in Newfoundland were prepared for presentation at meetings of two professional organizations. A mensurational survey of exotic trees in certain parts of the city of St. John's was carried out with assistance from provincial and municipal authorities. A shelterbelt of *Salix pentandra* was established in St. John's.

Projection: Remeasurement data from the experiment comparing techniques for releasing softwood regeneration from unmerchantable hardwoods will be published; and cooperation with industry in monitoring the effects on vegetation of softwood release treatments will continue. Publication of the major work on the regeneration research demonstration area at North Pond will be completed, and improvements will be conducted on several of the plantations. Survival and growth data from the cooperative plantation trials will be monitored and tended, and several new seedling quality trials will be established. A poster on the trials will be prepared and presented at the International Planting Symposium in the Netherlands. A publication will be prepared on the results of recent remeasurements of peatland plantations in central Newfoundland. Organization of the major symposium on silviculture in Newfoundland will be completed, several papers will be contributed to the symposium, and the proceedings will be edited and published. Work on communication and demonstration of regeneration research results to forest managers will continue through workshops and advisory services. Establishment of experimental shelterbelts and exotic trees

will be conducted. Comprehensive regeneration stocking standards for black spruce and preliminary stocking standards for balsam fir will be developed from existing information and additional data collected from temporary and permanent sample plots. A report on the development of stocking standards for black spruce will be produced. Additional large-scale aerial photography of regeneration will be taken, all data will be analyzed and results presented in a technical report. A user manual on large-scale aerial photography for regeneration surveys will be compiled in cooperation with Northern Forest Research Centre. The effects of microclimate on tree development and the implications for plantation forestry in Newfoundland will be investigated.

List of Studies:

1. Potential of large-scale aerial photography for surveying forest regeneration
2. Techniques to control alder competition in artificially-seeded stands
3. Control of hardwoods on highly productive forest sites
4. Control of Kalmia invasion of productive forest sites
5. Regeneration research at North Pond Experimental Area
6. Shelterbelt research on heathland, peatland and urban environments
7. Development of regeneration stocking standards for Newfoundland and Labrador
8. Silvicultural workshops and regeneration prescription demonstrations
9. Plantation research

PROJECT 2303
Tree and Stand Growth

Project Leader: R.S. van Nostrand

Objectives: To assess the growth and yield potential of Newfoundland's principal tree species in response to practices of stand manipulation.

Achievements Current Year: Detailed radial growth measurements were completed for an additional 1500 tree discs from the fertiiization trials. One new pre-commercial thinning experiment was established in a young balsam fir stand. The mobile field laboratory designed to measure respiration of tree boles was set up on a new site. During early and mid-summer, data were collected from young balsam fir growing at two spacings.

Projections: To complete the measurements of radial increment on the stem analyses discs from the fertilization trials, and proceed with the analyses of data. To establish one new pre-commercial thinning experiment and apply fertilizer to two previously established experiments. To complete a PhD thesis based on results and analyses of respiration and growth data collected during the past two years. To publish a technical report on the construction and use of the xylometer.

List of Studies:

1. Influence of stand density on productivity of natural and planted stands
2. Forest fertilization trials
3. Forest productivity on cutovers
4. Relationship between growth and respiration in young balsam fir trees

FOREST PROTECTION RESEARCH

Program Manager: J. Hudak

PROJECT 2402

Pest Biology Research

Project Leaders: A.G. Raske and P. Singh

Objectives: To develop effective and practical methods for measuring population levels of forest pests and their natural control factors; to investigate the biology of pest insects and diseases including their population dynamics; to assess insect and disease impacts on major age classes of forest trees and stands; to develop methods to prevent or minimize forest losses.

Achievements Current Year: Population levels of the spruce budworm were measured for the eighth complete generation in 1982. Larval numbers were high in western plots but low in eastern plots. The data for all generations are now being placed on computer and being analyzed. The incidence of biological control factors (predators, parasites, and diseases) in 1982 budworm populations was determined. About 11% of budworm larvae were parasitized; about 12% diseased. Field trials in 1982 to establish the pathogenicity of *Paecilomyces farinosus* were successful. A nematode was used successfully to kill larvae and pupae of the budworm and other insects in the laboratory. Permanent sample plots in fir regeneration were monitored again in 1982. Trees that survived severe defoliation in the mid 1970s have now almost completely recovered. Data will be used to develop a model to forecast crown development following budworm damage. Annual monitoring of 77 permanent plots in semi-mature stands continued. Severity of current defoliation dropped to 2% in 1982 compared to 16% in 1981. Cumulative tree mortality levelled off at 25% for fir and 20% for spruce. In general, tree vigor in balsam fir increased in 1982 but declined in black spruce. Several representative damaged stands in central Newfoundland were surveyed, and some data collected to assess the impact of the spruce budworm on forest succession. Monitoring of the inland spruce cone rust was continued and several new and additional infections were observed. The disease was more severe and conspicuous in 1982 than in 1981. Field application of the 'Cone Rust Intensity Rating Scale' (CRIRS) was confirmed in both the black and white spruce. More fungal isolations were made from the seeds and cones collected in 1981-82 to determine additional fungi associated with them. For unknown reasons, population levels of all insect species commonly observed on black spruce cones were very low in 1982 and no progress was made towards developing sampling procedures. Larvae of a dark-winged fungus gnat, *Bradysia* sp. were observed emerging from developing black spruce cones. A report of the 1981 field season's work on the development of balsam woolly aphid attack in balsam fir stands was prepared. Field measurements taken in 1982 completed the data collection phase of this study. Data collected since the work began in 1971 are begin assembled for analysis. Laboratory colonies of hemlock looper were established at NeFRC and at FPMI for continuing contract research to identify and synthesize the pheromone. Armillaria root rot was again observed to cause mortality in several softwood plantations. It was also found in many cutover areas where new plantations are being established in these areas. Heavy infestation of many stumps, and profuse growth and branching of rhizomorphs in the upper layers of soil and humus indicated the actively spreading pathogen. Inves-

tigations were conducted to determine the combined effects of soil nutrients and pH on the susceptibility of four softwood species. A higher percentage of roots and seedlings were infected and more seedlings died on deficient soil than on non-deficient soil. Investigations were also conducted to determine the distribution and severity of Armillaria root rot in balsam fir stands damaged by spruce budworm. Results show that the incidence and intensity of the root rot, in general, increased with the severity of the budworm damage from light to the dead damage class. Preliminary examination of several stands of black spruce in central and eastern Newfoundland have shown general deterioration and increased tree mortality in about 80,000 ha. These stands were severely damaged for several years by the spruce budworm, but showed a good recovery during the past two years following the decline of budworm numbers. Examination of many of the dying and dead trees have revealed the presence of Armillaria mellea, the pathogen of the root rot, along with the four-eyed spruce bark beetle, *Polygraphus rufipennis*. Investigations were continued on the deterioration of trees damaged by insects. Wood piles of 4' and 8' lengths were established to study deterioration and rate of insect colonization in stored wood. The piles were sampled in the fall of 1982 and work is progressing on the identification of causal organisms and insects. In 1982, 35 sample trees from eight plots in western and central Newfoundland were cut and samples taken to check the rate of deterioration of spruce and fir trees killed by the spruce budworm. A shigo metre was used to determine changes in electrical resistance in healthy and insect damaged trees. The field work for the intensive cull survey was completed during the 1982 season. A total of 318 plots distributed over 17 management units were completed. All preliminary computations and specific gravity determinations are completed and stored on computer tape. A preliminary test on a sample of data was conducted for developing cull factors for various forest types of Newfoundland. Investigations on the role of woodborers in tree deterioration were in abeyance because of the extremely low populations of all major species woodborers. A study to determine the relationship between felling date and woodborer density failed when all logs used in the study were without woodborers. Other studies have also been prevented by low populations of woodborers. Information output has included participation in a number of meetings of forestry officials in the region for communication of results and studies. Special meetings have been held for discussions of Armillaria, cone and seed insects, their impact and control. Researchers attended national meetings to present results of their research. A total of five journal papers, one information report and 12 unpublished reports and contributions have been prepared.

Projection: Data collected on budworm populations for several seasons will be prepared for publication. A report on the degree days required to complete larval development in Newfoundland will be completed. The average percent mortality of budworm populations by parasitism and disease will be determined. Attempts will be made to initiate epizootics of budworm fungi. To continue a program leading towards introduction of exotic budworm parasites. Continue contract research on the potential of nematodies for budworm control. To complete a report on the immediate impact of the budworm on fir regeneration and to continue annual monitoring of damage. To continue annual monitoring of budworm damage in semi-mature stands of spruce and fir. To continue tree-ring analysis to determine radial increment-loss due to defoliation. To analyze data on forest succession and to survey areas in central Newfoundland for forest-succession studies. Studies on the effect of insect and disease pests on cone and seed production by softwoods will continue. Emphasis will be paced on the pests of black spruce. Investigations on inland spruce cone rust will continue. Special survey will be conducted again to determine cone and seed disease problems in various cone producing areas. Isolation of fungal microflora from cones

and seeds will continue. Progress on the resurgence of the balsam wooly aphid in western Newfoundland will be monitored. Suitable sampling units will be identified to detect population of aphid and damage to trees. Data from the long-term study to identify stand characteristics vulnerable to aphid attack will be analyzed. Develop and maintain a laboratory colony of hemlock looper and continue contract work on sex pheromones. Greenhouse experiments and surveys in spruce budworm damaged stands for Armillaria root rot will continue. Special investigations will be conducted in black spruce stands damaged by spruce budworm. Work on deterioration of trees will concentrate on assessment of harvesting losses experienced in timber killed by the spruce budworm. Assessment of wood deterioration within established stacked wood piles will continue. Continue measuring the progress of tree mortality in permanent plots. Continue assessing the progress of saprot and intensity of woodborer attack in logs. The study on decay and form defects in living trees will be continued. Work will proceed on stratification of cull regions across the province devised from cull study data (based on site and stand factors and wood density). Volume tables for gross and net sawlog volume and residue will be published. Identification of organisms causing decay will continue. To install computer tapes of cull survey data presently in Ottawa on NeFRC PDP 11/44. To analyze the whole data base to prepare cull factors for site types used in Newfoundland management inventory. Sample all trees on budworm impact plots for woodborer density, species, and saprot penetration. Investigate life history and tolerance to cold and humidity of *Dendroctonus simplex* and *Polygraphus rufipennis*.

List of Studies:

1. Cone and seed fungi of softwoods
2. Insect damage in cone and seeds of softwoods
3. Development of damage from balsam woolly aphid in balsam fir stands
4. Sex pheromone(s) of the eastern hemlock looper
5. Armillaria root rot
6. Deterioration of trees damaged by insects
7. Decay, microflora and wood quality of living trees
8. Role of woodborers in tree defoliation
9. Population studies of the spruce budworm
10. Influence of weather on populations of the spruce budworm
11. Role of predators, parasites and diseases on the population dynamics of the spruce budworm
12. Impact of spruce budworm on immature stands
13. Impact of spruce budworm on semi-mature stands
14. Impact of spruce budworm on cones and seeds
15. Impact of spruce budworm on wildlife forage
16. Impact of spruce budworm on forest succession

PROJECT 2404
Biological Control Research

Project Leader: K.P. Lim

Objectives: To develop effective biological control of forest pests; to evaluate the effect of chemical insecticide(s) on biological control agents of forest pests; to investigate the potential use of entomogenous nematode as a biological control agent of forest pests.

Achievements Current Year: *European pine sawfly* — Both the larval and cocoon parasites were established. Host larval and cocoon samples were collected from release sites. Aspects of the biology of the larval parasite were studied.

untain-ash sawfly – Parasite release was not possible due to the asynchroniza-n of host insect development. Larval samples were collected to recover possi- progeny of the 1981 release. These samples are under rearing. *Larch sawfly* A total of 4686 host cocoons were received from the Northern Forest search Centre, Edmonton, and 1651 individuals of the larval parasite emerged. out 600 emerged parasites were released into field cages. Host cocoons overed are now in rearing to determine the initial establishment of this para-. *Hemlock looper* – Study is initiated to evaluate the role of the introduced hinid, *Winthemia occidentis,* in the population dynamics of the host. *Effects Chemical Control* – The effect of 1982 chemical sprays on the parasites of spruce budworm was not studied. *Entomogenous nematode* – A contract earch on the feasibility of the use of a rhabditid nematode for the control the spruce budworm is conducted by Drs. J.R. Finney and G.F. Bennett, morial University of Newfoundland. Preliminary results showed that the matode causes mortality of the spruce budworm under laboratory conditions.

ojection: More emphasis will be placed on aspects of life history of parasitoid ects and host-parasite interactions. Studies on the biology of the larval para- of the European pine sawfly will continue. A nuclear polyhedrosis virus l be introduced. Additional field releases of the larval parasites of the larch fly will be made and the effectiveness of the parasite will be determined. ditional larval parasites of the moutain-ash sawfly will be introduced from ebec and released into field cages. Continue to collect hemlock looper mples to determine the effectiveness of the introduced tachinid, *W. occidentis.* ntinue to evaluate the effect of insecticide application on the major spruce dworm parasities if and when necessary. Provide scientific authority on con-ct research on nematodes for control of forest insect pests. Work will empha- production and storage of nematodes and greenhouse trials.

t of Studies:

- Populations of biological control agents
- Effect of insecticides on biological control agents
- Control of forest insect pests with nematodes

ROJECT 2601

orest Insect and Disease Survey

oject Leader: P. Singh

jectives: To conduct systematic surveys of forest pest conditions, deter-ne the extent of infestations, assess the impact, forecast impending condi-ns, and recommend control measures and when necessary evaluate the effec-eness of direct control measures; to provide forest pest data and related ormation for the National Forest Resource Data program of Canada.

hievements Current Year: The annual general detection, monitoring, appraisal and forecast of forest insects and diseases have been completed, the data alyzed and interpreted, and presented to forest resource managers in the rm of publications, reports, and at special seminars and meetings. Data from e above surveys provide resource managers with the information necessary to aluate the problem and to plan and conduct the control action necessary. The ruce budworm continued to be the most serious pest of Newfoundland forests. 1982, light, moderate and severe defoliation occurred in about 90,000 hec-es on the Island, a decrease from the 400,000 ha in 1981. The area of oderate and severe defoliation totalled about 41,000 ha, also a decrease from e 380,000 ha recorded in 1981. The spruce budworm egg-mass survey was nducted in over 800 locations throughout the province to provide a forecast

of outbreak in 1983. The area of moderate and severe defoliation on the Island is expected to be about 110,000 ha stretching from the Codroy Valley to Deer Lake in western Newfoundland and in a small area along the Noel Paul's Brook in central Newfoundland. Light defoliation is forecast in about 102,000 ha distributed in isolated patches from the Codroy Valley to Roddickton and east to the Avalon Peninsula. In Labrador, moderate to severe defoliation is forecast to occur in about 1,000 ha along Beaver River and light defoliation on about 100 ha near Goose Point. Based on tree conditions and expected defoliation, the areas of moderate to high hazard for the Island and Labrador are forecast to be 165,000 ha and 1,100 ha respectively. The outbreaks of spruce and larch beetles continued to cause tree mortality in white spruce in Western Newfoundland and in tamarack throughout the Island. Several major black spruce stands in central and eastern Newfoundland have shown a general decline of vigour and increased tree mortality in about 80,000 ha. Tree mortality ranged from 20% to 80% in 30,000 ha and poor tree condition with lesser amounts of mortality in 50,000 ha. These stands have been severely damaged for several years by the spruce budworm but had shown good recovery during the past two years following the decline of budworm populations. Ground checks and surveys showed tht the four-eyed spruce bark beetle, *Polygraphus rufipennis,* and Armillaria root rot by *Armillaria mellea* are present in these stands and are hastening tree mortality. A random survey of balsam woolly aphid damaged continued in 1982 and results showed that the damage was increasing. The larch sawfly outbreak continued to expand in central Newfoundland from Deer Lake to Springdale and south to the Red Indian Lake area. Pheromone traps were used in early July to confirm an invasion of spruce budworm moths throughout western and central Newfoundland. Traps distributed from Port aux Basques to Hawkes Bay and east to Bishop's Falls all had catches of budworm adults. These moths were transported to Newfoundland on air currents from the Maritime Provinces or Quebec. Special surveys were conducted to monitor the possible accidental introduction of the gypsy moth and forest tent caterpillar by travelling tourists from infested areas in mainland Canada. Pheromone traps were set out in cooperation with Agriculture Canada near parks and towns where the travelling tourists would stay. FIDS organized an Island-wide survey in cooperation with all forest agencies and Plant Quarantine Division of Agriculture Canada to define the distribution of Scleroderris canker *(Gremmeniella abietina)* of pines. The survey included all major urban areas and communities, all natural stands of red pine, and plantations of various pine species. The disease was found on ornamental trees of red, Scots, jack and black Austrian pines at 18 new locations in and around St. John's area, and on the Salmonier Line about 59 km southwest of the city. The latter location is the first record of this disease outside the vicinity of St. John's and outside the quarantine area established by the Provincial Department of Forest Resources and Lands in 1981. Surveys of pines in all other urban areas, plantations and natural stands of pines failed to show the presence of the disease. The Plant Quarantine Division of Agriculture Canada and provincial Department of Forest Resources and Lands have taken measures to prune or remove and burn the diseased trees. Eastern dwarf mistletoe, *Arceuthobium pusillum,* continued it spread and caused damage in central and western Newfoundland. Several new infection centres were observed in central Newfoundland, and on the Northern Peninsula. Requests from the forest industry, parks and the general public for information on identity and control of pests of forest, shade and ornamental trees and shrubs were satisfied by providing verbal and written advice.

Projection: Continue surveys for detecting, appraising and forecasting pest conditions in general and with special emphasis on spruce budworm, hemlock looper, balsam woolly aphid and Scleroderris canker, and general pest conditions in forest improvement areas. Disseminate information to forest agencies

and the general public through written papers, reports, seminars, workshops and verbal communications. Provide information on forest pests for inclusion in national publications. Cooperate with the Department of Forest Resources and Lands in the publication of information leaflets on common forest pests of Newfoundland.

List of Studies:

1. Detection and forecasting forest pest conditions.

FOREST DEVELOPMENT
Program Manager; J.A. Munro

PROJECT 3101
Management and Common Support
Project Leader: J.A. Munro

Objectives: To provide management and common support services to the Forest Relations and Economic Development Branch at NeFRC; to discharge the economic analysis and development responsibilities of the branch.

Achievements Current Year: Staffing of the positions of – Program Manager, Senior Economist, Senior Implementation Officer, Senior Forest Resource Development Officer and Forest Development Officer has been completed. In addition, office space, furniture and equipment has been acquired for the branch.

Projection: Provide managerial and common support services for the Forestry Relations and Economic Development Branch.

PROJECT 3202
Statistical Services
Project Leader: G. Milne

Objectives: To improve and update the data base of regional forestry and forest industry statistics; to develop a computer information system for statistics generated through forestry development agreements in the province.

Achievements Current Year: Information is being added to the regional statistical data base and stored in the computer as it becomes available.

Projection: Continue to update and improve regional forestry and forest industry statistics. Create a computer information system for data related to development agreements. Add a graphics capability to the computer data system.

List of Studies:
1. Newfoundland forestry statistics
2. Development agreement statistics

PROJECT 3204
Economic Studies
Project Leader: G. Milne

Objectives: To conduct applied research studies in forest economics, directed towards particular resource management problems and opportunities in Newfoundland.

Achievements Current Year: Short-term economic studies are being carried out

as required. Major studies which are continuing include the economic impact of forest based industries, impact of losses to the spruce budworm, and economics of biomass utilization.

Projection: Conduct short-term analyses in support of advisory and consultation services as required. Complete study on economic impact of sawmill and wood products industries and publish reports. Continue work on economic impacts of spruce budworm damage in Newfoundland and prepare a report. Complete study of economics of biomass utilization. Initiate a study on economic rotation ages for coniferous species in Newfoundland.

List of Studies:
1. Short-term economic analyses
2. Economics of biomass utilization for energy
3. Economics of forest protection
4. Economic impact of forest industries
5. Ecnomic rotation age of coniferous tree species in Newfoundland

PROJECT 3603
Policy Implementation-Development Agreements
Project Leader: J. Munro

Objectives: To discharge federal responsibilities for the implementation and evaluation of the Newfoundland Forestry Subsidiary Agreement and FESP (Forestry Economic Stimulation Program); to provide federal forestry leadership in the development, implementation and evaluation of forestry job creation projects.

Achievements Current Year: Responsibility for the Newfoundland Forestry Subsidiary Agreement and FESP was transferred from the Department of Regional Economic Expansion to CFS in September, 1982. The first priority was to establish accounting procedures in the administration section of NeFRC so that claims for payments due the Province under the agreement could be received, processed and paid. This was accomplished by the administration section with no interruption in the cash flow of the agreement. Meanwhile, CFS responsibilities for co-chairmanship of the management committees of the agreements and support services to the evaluation committees was continued without interruption. The CFS took over the co-chairmanship of the evaluation committees, January, 1983. The Unemployment Insurance Job Creation Program, utilizing funding provided under Section 38 of the Unemployment Insurance Act and special operations and maintenance funds made available by Cabinet to the CFS, was also implemented in 1982-83. Three projects by Cabinet to the CFS, was also implemented in 1982-83. Three projects were initiated on federal lands (two in co-operation with Parks Canada) and negotiations have been ongoing with the Province, industry, and CEIC with a view to implementing a number of projects on provincial lands in 1983. Several small scale in-house job creation projects have also been initiated under the NEED program.

Projection: Continue with managerial and evaluation responsibilities for the Forest Subsidiary Agreement. Expenditures in 1983/84 are expected to be in the vicinity of $11 million on various activities such as silviculture, forest access roads, forest inventory, and forest products development. The CFS will continue to co-chair both the management and evaluation committees for the agreement. Continue with management and evaluation responsibilities for the FESP agreement. This agreement expires on March 31, 1983; however, CFS responsibilities

will continue to the end of the next fiscal year to process claims and complete a final evaluation report. In addition, the Province has applied to the federal government for continued funding of FESP activities. If the federal response is positive, negotiations will be undertaken to conclude a new agreement. If an agreement is concluded, CFS will have responsibilities for federal management and evaluation. Continue to implement the Unemployment Insurance Job Creation Program for the Forestry sector. Thre will be three on-going projects on federal lands and negotiations are presently under way with various agencies which may result in additional projects being implemented. A number of additional in-house projects may also be implemented under the NEED program.

List of Studies:

1. Forestry Subsidiary Agreement Implementation
2. Forestry Economic Stimulation Program
3. Employment Stimulation Programs
4. Forestry Subsidiary Agreement Evaluations
5. Employment Stimulation Program Evaluations

NEWFOUNDLAND FOREST RESEARCH CENTRE
EXPENDITURES ($000's) 1982-83

Program Area	P/Y	Salaries	N.E.E.D. Program	C.E.I.C. Program	Development Agreements	S.C.S.E.P.	O & M	Capital	Total
Management	6.74	248.5				45.0	62.9	1.7	358.1
Administration	14.27	299.1					250.9	71.8	621.8
Forest Resources	30.83	873.1					259.6	86.1	1,218.8
Forest Protection	24.56	680.7					159.1	18.1	857.9
Forest Development	6.0	71.7*	23.4	165.2	9,392.6		47.2	17.1	9,717.2
Technology Transfer	1.0	32.5					7.6	.7	40.8
ENFOR							347.3	1.4	348.7
TOTAL	83.4*	2,205.6	23.4	165.2	9,392.6	45.0	1,134.6	196.9	13,163.3

*Includes 28 COSEP students seasonally employed.

STAFF LIST AND ORGANIZATION 1982-83

Regional Director — Dr. W.J. Carroll

Secretary — E.E. Manuel

FOREST RESOURCES AND ENVIRONMENTAL RESEARCH

Program Manager — Dr. F.C. Pollett — A.B. Case (Acting)

Chemical and Physical Analysis Laboratory	J.G. Zakrevsky, E.M. Pike, E.R. LeBreton
Forest Ecology — Impact Assessment	A.B. Case
Forest Ecology — Succession	W.J. Meades, G.J. Mills
Wetland Ecology	E.D. Wells, S.M. Morgan
Soils — Autecology	B.A. Roberts, B.A. Janes
Silviculture — Forest Regeneration/Hardwood Control	J. Richardson, V. Chaffey
Silviculture — Mensuration, Biomass, Fertilization	R.S. van Nostrand, J.G. Donnelly
Silviculture — Natural Regeneration	J.M. Butler, R. van Kesteren
Tree Biology — Forest Genetics	Dr. J.P. Hall, W.J. Curran
Tree Biology — Forest Genetics	Dr. M.A.K. Khalil, L. May
Ecophysiology/Stand Modelling	M.B. Lavigne, P.T. Tricco
Pollution Ecology — Air Pollutants and Toxic Chemicals	Dr. S.S. Sidhu, C.T. French
Herbarium Curator	S.M. Morgan
Nursery Services	C.H. Evans
Biogreography/Biometeorology	A.W. Robertson

FOREST PROTECTION RESEARCH

Program Manager — Dr. J. Hudak

Insect Populations	E. Dobesberger, J. Carter
Entomology — Damage and Impact	Vacant, D. Durling
Entomology — Damage and Impact	Dr. A.G. Raske, J.D. Rowe
Entomology — Biological Control	Dr. K.P. Lim, L. Oldford
Mycology, Pathology, Insect & Disease Survey	Dr. P. Singh, G. Carew
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Forest Insect & Disease Survey	L.J. Clarke, K.E. Pardy, E.D. Banfield, D.S. O'Brien, W.J. Sutton, D.M. Stone

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1982/83

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